

1. INTRODUCTION

Water plays a central role in the greenhouse effect in the Earth's atmosphere. The quantity of water substance (water vapor plus condensed water) in the upper troposphere and lower stratosphere (altitudes of approximately 6 to 18 km), is especially important to the modeling of the global climate.^[1,2] Of particular interest is the water substance in the vicinity of the tropopause, whose altitude varies from ~18 km near the equator to ~8 km near the poles. However, empirical data concerning the mean water substance content and its spatial and temporal variability through this range of altitudes are extremely sparse and are inadequate for meaningful comparison with the predictions of global climate models.^[3] The Airborne Remote Earth Sensing (ARES) program, which employs a WB-57F aircraft that can fly at a wide range of altitudes as high as 19 km, provides a powerful new resource for measuring the atmospheric water substance content through the critical range of interest.^[4]

In Section 2, we describe the WB-57F aircraft utilized on the ARES program, and in Section 3 the imaging spectrometer used to take the data is detailed. Section 4 includes the analysis methods employed to make the preliminary data reductions given in Section 5, with summary and conclusions in Section 6.